WHAT IS MAN?[1]

I

THE HUMAN SPECIES

1. INTRODUCTION

I AM not so vain as to suppose that I can give any complete or satisfactory answer to the old question of the Psalmist, "What is Man?" embracing as it does every aspect of every type of human being and of every form of the multitudinous activities of men in all parts of the world throughout a hundred or more centuries. Any attempted answer must necessarily be incomplete and hence unsatisfactory, and it must partake of the limited nature, experience, and knowledge of the person who undertakes it.

Multitudes of books have been written in answer to the question, "What is Man?" Indeed all books ever written are partial answers to this question; all sciences, literature and art; all history, social institutions, and religions must be taken into account in attempting any complete answer. This is enough to indicate that the whole experience of the human race must be drawn upon in any comprehensive consideration of this subject. The impracticability if not impossibility of such an undertaking suggests the necessity of dividing, classifying, and analyzing its contents and of

[1]A course of three public lectures delivered on the Sharp Foundation of the Rice Institute, May 7, 8, and 9, 1941, by Edwin Grant Conklin, Ph.D., Sc.D., LL.D., Professor Emeritus of Biology at Princeton University, Executive Vice President of the American Philosophical Society.

dealing with only a few aspects of this all inclusive subject.

A partial analysis and classification of the various aspects of human nature and activity may be outlined under the following headings:

A. Objective or realistic phenomena, including the (1) biological, (2) anthropological, (3) ethnological, (4) psychological, (5) sociological, (6) historical. B. Subjective or idealistic aspects, such as the (7) self-conscious, (8) emotional, (9) artistic, (10) ethical, (11) humanistic, (12) religious. The former has been called the outer or public, the latter the inner or private aspect of man.

Such a classification is not only incomplete but it unduly emphasizes the distinction between these various aspects of man. It is useful, as all analyses are useful, as a means of accommodation to our limited intelligence which is able to consider effectively only one phase of anything at a time; but it is harmful if it leads to the conclusion that any of these various aspects of man is complete in itself, or that a real human being can be divided into these different categories. These are mere aspects or points of view of a many-sided object-subject which remains an indivisible unity; furthermore most of these subdivisions overlap to such an extent that no sharp separation of one from another is possible. Throughout all phases here classified as objective aspects of man runs the idealistic thread of subjective thought and experience; underneath all subjective phases is the basis of objective science.

Formerly the attempted answers to this great question emphasized the idealistic characteristics of man. "Thou hast made him a little lower than the angels," said the Psalmist. "Man is a spirit, an immortal mind and soul, temporarily housed in a mortal body," say the idealists. With the growth of objective science emphasis has swung

to the opposite extreme, "Man is an animal, one of a million other species of animals. Mind and emotions are mere functions of the body," say these scientists. This objective aspect of man has almost completely obscured or eliminated the subjective phase in modern scientific writings and has sometimes led to a denial of the reality of consciousness, freedom, and purpose, apparently with the thought that things which cannot be explained by mechanistic science must be explained away.

A multitude of recent books have dealt with man from the objective or more strictly scientific point of view. Among some of those which have presented ably the biological aspects are Jennings' *The Biological Bases of Human Nature,*[1] Haldane's *Science and Human Life,*[2] and most recently Sherrington's *Man on his Nature.*[3] These books adhere to the strict canons of mechanistic science and touch only briefly if at all upon subjective phenomena. Another book which has had a great popular appeal because it attempts to combine in a scientific setting the objective and subjective aspects of man is Carrel's *Man the Unknown.*[4] Its discussion of the physiological and medical aspects of man conforms to the usual methods of science and shows that although much is known regarding these phenomena much remains unknown. But in its defense of extra sensory perception, telepathy, clairvoyance, miraculous healing, etc., it departs widely from the accepted methods and conclusions of objective science. Although this book has had a great reception among the non-scientific public, and especially by those who have feared and dreaded the applications of the methods of objective science to the study of

[1]H. S. Jennings. New York, Norton, 1930.
[2]J. B. S. Haldane. New York, Harpers, 1933.
[3]Sir Charles Sherrington. New York, Macmillan, 1941.
[4]Alexis Carrel. New York, Harpers, 1935.

human nature, it has in general met with a cold reception by the scientists; this applies especially to those parts of the book which attempt to correlate objective science with subjective phenomena.

Other recent books on human nature deal more fully and frankly with the emotions, aspirations, and ideals of man, from the idealistic point of view, although with certain recognition of the rights of science in its own field, which is usually interpreted as the objective field only, although sometimes suggesting that science may some day be able to deal with subjective phenomena. One of the best of these is by W. Macneile Dixon, formerly Professor of English Literature in the University of Glasgow, and is entitled *The Human Situation*.[1] It consists of the Gifford Lectures at the University of Glasgow for 1935–37. Another book in this class is by a former colleague of mine at Princeton University, the late Professor Archibald A. Bowman, Professor of Moral Philosophy in the University of Glasgow from 1926 until his death in 1936. His lectures on the Vanuxem Foundation at Princeton in 1934 have recently been published under the title, *A Sacramental Universe*.[2] This book regards not merely man, but the entire universe, as the title suggests, as a "Conjunction of physical and subjective systems . . .," the sacramental character arising "through a prior union of the physical and the subjective in a mode of being which reveals itself . . . either as embodied spirit or as the living body." Finally Reinhold Niebuhr of the Union Theological Seminary has just published his Gifford Lectures, under the title, *The Nature and Destiny of Man*.[3] These books deal with man and his relations to the universe with a wealth of literary, historical,

[1]New York, Longmans, 1938.
[2]Princeton University Press, 1939.
[3]New York, Scribners, 1941.

and philosophic erudition. But none of these distinguished scholars treats of man from that point of view with which I am most familiar, namely, the developmental. They consider man in his fully developed state as a self-conscious personality or embodied spirit. I propose to reverse this procedure and to deal with him in the process of his becoming what he now is, and of forecasting, as far as that is possible, where he is going.

I may say at once that I am fully convinced that all phases of human nature are amenable to scientific treatment and must be studied, if studied at all effectively, by scientific methods. These methods consist of careful, systematic, verifiable observations of phenomena, and logical deductions as to their causes, which deductions are then tested by further observations and, whenever possible, by experiments aimed to segregate or isolate various factors or causes. It is more difficult to apply such scientific methods to the study of man than in the case of other organisms, and it is most difficult to apply them to subjective phenomena. But in spite of all difficulties much progress has been made in the scientific study of the entire man.

There are some mathematical and physical scientists who would deny the name of "science" to any investigation that cannot be expressed in mathematical formulae. To them science is measurements and numbers, and consequently there is very little in the study of man that they would recognize as their kind of exact science. But there is a vast deal of organized knowledge, which cannot now be expressed quantitatively, and which is known as descriptive science. Here must be classed most of the natural sciences such as geology, biology, psychology, anthropology, ethnology, and sociology. Some of these are gradually passing from the descriptive to the experimental stage, but a vast

deal of knowledge in these fields cannot be expressed in quantitative terms.

Three principal methods have been employed effectively in biology in seeking to analyze phenomena and to determine their causes. The first of these is the method of *comparison,* by which similarities and dissimilarities are observed, general conditions are distinguished from special ones and thus relationships are established; the value of this method has been demonstrated in comparative anatomy, physiology, psychology, and in fact in all the natural sciences. The second of these methods is that of *development* which analyzes complex phenomena by tracing them back through their development to simpler and simpler conditions; the value of this genetic method is recognized in all the natural sciences. The third method is that of *experiment* which seeks to determine the causes of phenomena by eliminating certain factors or changing certain conditions and noting the results; if carefully carried out and with adequate controls, that is, comparisons with unchanged conditions, the experimental method is the most exact of all.

In a scientific study of man all of these methods have been employed with marked success, although experiment is often impossible and adequate controls are generally lacking. Nevertheless such scientific methods of investigation are often repudiated by persons who regard man and especially human personality as above and beyond scientific analysis. Such methods of analysis are denounced as "biological naturalism." I once heard a former President of Princeton University describe with inimitable humor the new kind of scientific psychology which studies the behavior of monkeys (comparison), of babies (development), and of idiots (nature's experiments), instead of beginning and ending with the introspective study of mind and soul.

However, the study of the behavior of animals, especially primates, and of genetic psychology, defective mentality, pathological psychology, and psychoanalysis have thrown a flood of light upon hitherto obscure phases of normal psychology and have completely justified the scientific and naturalistic approach to some of the most complex phenomena of human personality.

As a biologist I propose to begin with a consideration of man as a biological organism who has developed out of a condition that is neither self-conscious nor spiritual in any sense in which other living creatures and the universe itself are not self-conscious and spiritual and then to consider the steps by which man has become a self-conscious personality, for I assume that no one capable of keen observation and deep reflection can really deny the fact that man has in his racial and individual development reached a stage in which he is a self-conscious personality, capable of forming rational judgments and purposes, that he has a sense of material and moral values, and in these respects may be said to be spiritual. The scientific study of man must be limited to the natural and it seeks to show the steps by which there develop out of relatively simple biological beginnings the amazing complexities of body and mind, of social and spiritual phenomena.

In these lectures I shall deal first with man from the biological point of view, then from the psychological and social standpoints, and finally I shall endeavor to correlate these findings of science with the philosophical problems involved in self-consciousness, a sense of material, moral, and aesthetic values, and the attainment of freedom and responsibility. The first lecture then may be entitled "The Human Species," the second "The Development of the Individual," and the third "The Real and the Ideal."

2. RACES AND TRIBES OF MEN

If a naturalist were asked "What is Man?" he would answer, "Show me the specimens." Viewing man as a biological object what do we see? About two thousand million living individuals, sufficiently alike in morphology and physiology to warrant their being classified as a single genus and species, *Homo sapiens,* and yet so different in inherited colors, bodily features, and proportions as to require their being classified in at least three primary races, the white, yellow, and black, or in the terms of Cuvier, the Caucasian, Mongolian, and Negro. Apparently the Old Testament classification into descendants of Shem, Ham, and Japheth does not recognize the Mongolian. Huxley added to Cuvier's three a fourth race, the Australoid, and other anthropologists have added the brown or Malay and the red or Amerind. In addition to these three to six primary races there are several minor subraces with more or less distinct hereditary characteristics, just as there are many breeds of horses, cattle, sheep, and other domestic animals.

"Species" is a biological concept hard to define, but there is general agreement that the best single characteristic of a species is ability of individuals of the two sexes to interbreed and produce fertile offspring. There may be a few exceptions to this rule but in general it holds true. All races and subraces of *Homo sapiens* do interbreed and produce fertile offspring. The biological basis for this is found in the behavior of the chromosomes in the formation of the germ cells and in their union in fertilization. All existing races of men have the same number of chromosomes in every one of their cells, namely forty-eight, half of which are from one parent and half from the other. Although every chromosome differs from every other one, the twenty-

four from the mother are so much like (homologous with) the twenty-four from the father that they can unite into twenty-four homologous pairs, which then separate at random in the cell divisions leading to the formation of eggs and sperms, so that each egg or sperm contains only one of each of these pairs of chromosomes of maternal or paternal origin. When such an egg is fertilized by such a sperm the full number of forty-eight chromosomes is restored. In this behavior of the chromosomes we have the explanation not only of Mendelian inheritance but also of fertility within a species and of sterility between different species, these being dependent upon the ability or inability of parental chromosomes to unite into homologous pairs.

Differences among Africans, Asians, and Europeans have sometimes been magnified to such an extent that these races have been classified as separate species. Defenders of African slavery used sometimes to deny that the Negro is human, but mulattoes demonstrated the contrary. Even within the white race distinctions between Nordics, Alpines, and Mediterraneans, and between so-called "Aryans" and Jews have been exaggerated beyond all science and reason.

On the other hand in the laudable attempt to combat so-called "raceism," or this exaggeration of racial differences, some humanists have gone to the other extreme and have virtually denied any racial differences, except possibly a few physical distinctions which are considered as only "skin deep." But of course the physical anthropologist knows that certain racial characteristics are found in practically every organ and system of the body, and these peculiarities are racial because they are inherited. Upon the existence of such inherited peculiarities all systems of biological classification rest. Of course such classification is not based upon the most extreme development of any character, but rather

upon the mean or "mode" in the curve of variation, and the fact that extremes of some characters of different races may overlap does not nullify such classification.

Structural peculiarities are associated with functional ones; indeed structure and function are inseparable in living things. Certain physiological peculiarities characterize different races, such as greater or less resistance to certain diseases. It is more uncertain whether temperamental, intellectual, and social qualities are inherited and hence characterize different races or even different families. Feeble-mindedness sometimes occurs in brilliant families and a "black sheep" now and then appears in the best families, but these departures from type are probably the result of the outcropping of latent or recessive traits, or are due to unfavorable environment during development. There is a physiological basis for some temperamental and intellectual differences in the varying activity of certain endocrine organs, which may in turn be inherited, but it is also well known that environment is an important factor. Given a typical or normal inheritance I think the evidence indicates that the direction and degree of intellectual and social development depend in part upon environment, though both heredity and environment are indispensable in any and all development. Environment and training may do much to diminish temporarily racial differences; kinky hair may be straightened and white skin made brown, as popular sun-baths demonstrate, ignorance may be diminished and social usefulness increased, but heredity can be changed only by selective breeding. But certainly there is no scientific warrant for branding all individuals of some races as inferior and all of other races as superior. All races have their good and bad specimens, their good and bad qualities, and a sane and sensible world would prize the peculiar

talents of each race, each contributing its particular endowments to the infinite variety and wealth of life.

To the naturalist the differences between human races, subraces, families, and individuals are small indeed as compared with their manifold resemblances. Biology and the Bible agree that "God hath made of one blood all nations of men." Our common traits and origin and fate, our common hopes and fears, joys and sorrows would call forth our common sympathy with all mankind, if it were not for the lessons of hate which have been cultivated and instilled by selfish and unscrupulous persons and social groups. These racial antagonisms are not the results of inexorable nature, nor of inherited instincts, but of deliberate education and cultivation.

There are primary and secondary human races with characteristic morphological and physiological differences that are inherited, and the same may be said of many of their psychic and social differences. There are also many breeds or stocks or families within these human races with hereditary characteristics that distinguish them from one another. These characteristics may be useful or harmful or indifferent depending upon our ideals of values, and since these ideals may be emotional rather than rational, notional rather than factual, they may be wholly erroneous. But certainly truth is not advanced nor justice promoted by denying the evident fact of racial and hereditary differences among men.

Nevertheless in spite of all these differences which may be classed as racial, subracial, or familial, all living human types are so much alike that they can and do interbreed and produce fertile offspring. By general agreement among naturalists this fact indicates that all types of living men belong to a single species, which was euphemistically named by the

great Swedish naturalist, Carl Linné in 1758 *sapiens,* or the wise, the knowing. All of these two thousand million living individuals, of the three to six primary races, more than four hundred subraces and tribes,[1] and innumerable hybrids, belong to a single zoological family, the *Hominidae,* a single genus, *Homo,* and a single species, *sapiens.* No other family, genus, and species of higher animals occupies so solitary a position in the animal kingdom, no other is so widely distributed over the earth's surface, no other is so dominant over all other animals and over all conditions of existence.

This dominion of man over other creatures and conditions has made it possible for man to occupy the whole earth. There is no region of tropic heat or polar ice where he has not penetrated, no mountain areas or plains or deserts he has not occupied, no conditions however adverse he has not attempted to conquer, usually with success. This dominion of man is due to his marvellous adaptability and his unique inventiveness. He not only adjusts his physiological processes to widely different environments, such as high and low temperatures and altitudes, various kinds and quantities of food and drink, numerous kinds of poisons and parasites, but he alone of all animals is able in large measure to control his environment, to modify or change climates by means of migration, clothing, housing, and air conditioning, and to bring food and drink and clothing from the ends of the earth.

3. THE PAST EVOLUTION OF MAN

This unique animal was not suddenly and miraculously launched into the world some six thousand years ago, as many have supposed, following Archbishop Usher's chro-

[1]See *Encyclopædia Britannica,* 11th ed. Index p. 883.

nology, but he came up through a long line of prehuman ancestors by a process of mutation and transformation such as has since led to the establishment of the various races of men. The theory of evolution has provoked controversy between realists and idealists ever since it was proposed in one form or another by Greek philosophers and naturalists. That controversy became intense with the publication of Darwin's *Origin of Species* in 1859; it was marked by violent opposition and emotional advocacy, but gradually scientific realism prevailed and there is now little if any scientific or philosophical opposition to the theory, although theological antagonism flares up from time to time, as in the campaign led by William Jennings Bryan. This opposition was directed especially against the theory of the evolution of man, and in particular against the natural origin of mind and morals. Language, reason, and ethics were held to be direct gifts of God, although the body of man might have been produced by evolution.

At present practically all scientists and philosophers as well as many theologians consider that man in his entirety, body, mind, and morals, has arisen by a process of evolution. This is a conclusion of vast importance, as revolutionary in its field as was the Copernican Theory in the field of astronomy. As Professor Jeans has said, "Man no longer sees nature as something distinct from himself." He also is a part of nature and all his characteristics are products of natural processes. Such a conclusion is generally known as "Naturalism" as contrasted with "Supernaturalism," and it has led to a revolution in science, philosophy, and religion. John Fiske said many years ago, "The great theory of evolution is rapidly causing us to change our opinions on all subjects whatsoever," and Macneile Dixon has recently said, "Since the Renaissance there has been no such upheaval

of thought, no such revaluation of values, as in the century upon which we have entered."

I shall not attempt here to deal with the evidences in favor of general evolution; this is now an old story and although there is much about it which we do not understand, many factors that remain to be discovered or explored, the fact of evolution is no longer questioned by men of science. Any admission that biologists do not know everything about the causes of evolution is sure to be seized upon by critics as evidence against the fact of evolution; but there are few things in the world whose causes we know fully, and yet this is no evidence against their existence, e.g., matter, energy, electricity, life, mind, morals, crime, insanity, cancer, etc., the causes of which are not fully known and yet their reality is beyond reasonable question. Let us turn then to some of the evidences of the evolution of the human species, *Homo sapiens,* seeking in his origin the scientific answer to the question, "What is man?"

There is no doubt that man more closely resembles the great apes, that is the gorilla, chimpanzee, orang, and gibbon, than any other living animals, and yet no biologist supposes that man has descended from any of these present species of anthropoid apes. On the contrary, the present species of man and of apes are diverging further and further from one another, and, conversely, as their lines of descent are traced back through fossils of extinct species they converge. But even in existing men and apes we find that there is scarcely a single bone, muscle, nerve, gland, or other organ of man that does not have its counterpart in these apes. As Romanes has strikingly remarked, "Here we have a fact, or rather a hundred thousand facts, that cannot be attributed to chance and if we reject the scientific explanation of common descent of man and apes we can

only suppose that the Deity in creating man took the most scrupulous pains to make him in the image of the beasts." Some opponents of the simian ancestry of man who nevertheless recognize that these numerous resemblances between man and apes require a rational explanation have proposed that apes are the degenerate offspring of men. It is curious how much more pride some people take in their ancestry than in their posterity!

Archaeological researches show that the existing species of man, *H. sapiens,* appeared during or slightly before the last great ice age, some twenty to thirty thousand years ago. But before that time there were several species of men or near-men that have been traced back to a period of at least a half million and perhaps a full million years ago. I well remember the amazement and incredulity of the non-scientific world when Dr. Eugen Dubois in 1892 announced the discovery in Java of some fossils of a creature which seemed to fulfill the hypothetical requirements of a connecting link between men and apes and which he accordingly named the erect ape-man, *Pithecanthropus erectus.* Recently the discovery of other similar fossils in Java has proved that Dubois' specimen was not unique but was correctly identified as an example of a real genus and species of pre-human type, the most primitive and ape-like that has yet been found. Since 1925 several fossil skeletons of a form nearly akin to the Java man, together with crude stone implements, charcoal, and bones of extinct species of animals, have been found in a cave near Peking, China, and named by Davidson Black, *Sinanthropus pekingensis.* At present these are the earliest known fossils of human type, but there is good reason to believe that still earlier and more primitive forms existed and that their remains will ultimately be found.

For reasons that can be readily appreciated fossil remains of men and apes are not as numerous as those of lower animals; they did not exist in such numbers as many of the more common vertebrates and their remains were not so apt to be buried in alluvial muds. But during the past fifty years many skeletons of ancient men have been found and still more stone implements and artifacts have been discovered. Some of the crudest of these artifacts are known as eoliths and they often indicate where primitive men have been, even though their skeletons are now lacking.

These earliest known representatives of the human family, the *Hominidae,* used fire, made stone or flint implements, and were far more advanced in such culture than any animal. There must have been a long period antedating these earliest known remains from Java and the cave near Peking during which prehumans were learning to make stone implements and weapons and to use fire. Paleontologists generally hold that the earliest prehuman stock separated from the line that gave rise to modern anthropoid apes not less than two million years ago. Since the time when these two lines separated each has diverged more and more from the other so that living men and apes are now farther apart than ever before. More recent types of fossil men, now long extinct, are represented by remains of the "dawn man" found near Piltdown, England, and named *Eoanthropus dawsoni;* another, represented only by a massive, chinless lower jaw, found near Heidelberg, Germany, has been named *Paleoanthropus heidelbergensis.*

All of these more primitive types of the human family are usually classified by zoologists as distinct in genera as well as species from modern man. More recent types of fossil men belong to the same genus *(Homo)* as modern man but not to the same species. One of the earliest of these

is *Homo soloensis* of Java, which appears to have been a later development of *Pithecanthropus*. The most numerous and widespread of these early representatives of the genus *Homo* is *H. neanderthalensis,* which was first found in the Neanderthal, Germany, but has since been found in many parts of Europe and in certain portions of Asia Minor. He was a creature of beetling eyebrows, heavy jowl, retreating chin, hanging head, curved legs and probably shuffling gait, that flourished some twenty to fifty thousand or more years ago. Another extinct species of man which shows certain resemblances to the Neanderthal species has been found in Rhodesia, Africa, and named *H. rhodesiensis.*

We do not know that these genera and species of early man were actual ancestors of modern man, but it is noteworthy that skeletons of modern man do not occur along with these more primitive precursors of *H. sapiens.* Early remains of the present species have been found in various places in western Europe, and especially in southern France. Some of these are distinguished by their characteristic cultures, as represented by artifacts. Thus, following the Neanderthal period, which ended about twenty thousand years ago, there were the Aurignacian of about fifteen thousand years ago, the Solutrean of some twelve thousand years ago, the Magdelenean of about ten thousand years ago. The people of the last-named era were the Cro-Magnon race of a physical type equal to or even superior to present races. All of these early stages of culture belong to the Paleolithic or Old Stone Age. More recent stages down to the use of metals are known as the Neolithic, or New Stone Age.

The people of all these cultural ages were modern men in that they belonged to the present species, *H. sapiens.* The history of modern man probably began about twenty thou-

sand years ago. While this seems long as contrasted with Archbishop Usher's estimate of about six thousand years, it is still very brief as compared with the whole past history of living things on the earth. Professor James Ritchie of Edinburgh University, in his presidential address before the zoological section of the British Association for the Advancement of Science in September, 1939, put this in a striking form by comparing the whole past history of life on the earth, probably about twelve hundred million years, with the twelve hours of the clock from midnight to noon. Each hour of the clock would correspond to a hundred million years, each minute to one and two-thirds million years, each second to twenty-eight thousand years. The long Archeozoic and Proterozoic Eras, when protozoa and protophyta which left few if any skeletal remains were the principal living forms, probably cover more than half of the entire history of life and bring the time o'clock from midnight to six or seven in the morning. The Paleozoic Era, when fishes and amphibia were the highest animals, brings our clock to 10 A.M.; the Mesozoic, or age of reptiles, lasted until 11:30; the Tertiary, or Age of Mammals, began about 11:45. Primitive man first appeared less than a minute before 12, and *Homo sapiens* less than a second before our present noon.[1] Verily we are late comers in this grand procession of life!

4. PATHS OF PROGRESS

In this long course of past evolution we find that there has been general progress from the simpler and more generalized to the more complex and specialized forms of life. First appeared single-celled organisms, then many-celled

[1]These figures do not correspond exactly with Ritchie's. See revision of his address in *Annual Report,* Smithsonian Institution for 1940, pp. 249–269.

ones with many different organs and systems; first aquatic forms, then terrestrial and aerial ones; first cold-blooded animals, then warm-blooded ones; first those with little or no specialized sensory and nervous systems, then those with highly developed brains and sense organs.

This general evolutionary progress which is seen when taking the long view of life on earth has led to the view that evolution always implies progress, but usually no attempt is made to define that term. As long as man was regarded as the goal toward which all evolution leads, progress meant movement in the direction of man and man's highest ideals. But from a broad biological point of view progress means movement toward the universal goal of living things, namely survival. Any change in an organism which leads to increased chances of survival is progress toward that goal and for that species, even though it may involve degeneration and parasitism. Progress for one species may not be such for another, indeed progress for predators and prey, for parasites and hosts, run in opposite directions. Increased chances of survival for one species generally mean decreased chances for some other species. We must therefore distinguish between general progress from relatively simple structures and functions of early stages of evolution and mere increase in chances of survival which may involve regression to simpler conditions.

Even a cursory view of the living world would justify the conclusion that evolution has proceeded in all possible directions. Organisms today appear to occupy every place in nature where life is possible, whether on or in the earth, in the air, or in or under the sea. Living things have achieved this wide distribution by means of their unique ability of adaptation to many different conditions. Consequently we find almost infinite variety in form and function

of organisms from bacteria to man, each being more or less fitted to some particular place in nature.

The evolution of man, like that of other organisms, has been marked by increasing adaptations to conditions of existence, and these adaptations may be classified as physical, intellectual, and social, or progress in body, mind, and morals. Some of the chief steps in this progress have been (1) the assumption of erect posture with the consequent freeing of the hands from locomotion, (2) the growth of the cerebrum with increasing psychic functions of intelligence, reasoning, inhibition, and will, (3) the development of articulate speech and other means of communication which have made possible larger social units, and (4) the growth of the "herd" instincts of protection, cooperation, and fellowship. Each and all of these lines of progress have made for increased chances of survival for ever larger numbers of individuals; in short, they are evolutionary adaptations to conditions of existence.

All these lines of progress are interrelated, and yet within certain limits they are independent, as is seen by the fact that progress has not been at a uniform rate in all. In some individuals development of the body outruns that of mind and morals, or *vice versa*. In similar manner, development of different portions of the body may lead to disharmony with other parts, for example, the teeth may be too large for the jaws, or fat too great a load for heart and muscles. The ideal physical condition is one in which there is harmonious development of all parts of the body. In like manner, the ideal mental and moral condition is that in which there is coordinated and harmonious development of the physical, intellectual, and social aspects of human nature.

The view is widely held that progress in body, mind, and morals will go on forever, or at least as long as the human

species shall endure. But, while many improvements in each of these lines are possible and practicable, there are limits beyond which the development of particular forms and functions cannot go. Erect posture can go no further than the vertical, hands cannot become more free for general uses than they are at present, the size of head and brain in relation to that of body cannot become much larger without making normal birth impossible and destroying the harmonious correlation of parts.

In spite of some individual exceptions, there is in general a positive correlation between cranial and intellectual capacity, larger brains being generally associated with larger intelligence. But there has been no significant increase in the size of the head and probably no increase in intellectual capacity since the Cro-Magnons. Of course there has been a vast increase in knowledge, but it is necessary to distinguish between number of things known and capacity to know. The schoolboy of today knows more things than Solomon did; Socrates, Plato, Aristotle would not be able to pass the present entrance examinations to college on the knowledge that they had, but does anyone suppose that they would be incapable of learning all that a Freshman knows or that they would be unable to finish the courses and to graduate along with the "wise old Seniors." There is no good evidence that there has been any notable advance in the intellectual capacity of man since the time of the ancient Greeks or Sumarians or Cro-Magnons. And what evidence can be brought in support of the belief in the everlasting increase in intellectual capacity?

The course of evolution in past ages shows that progress in any particular line sooner or later reaches a limit beyond which it can go no further without destroying the balance upon which all life depends. Dinosaurs and titanotheres

became extinct when giant size and enormous armor became a handicap. The giraffe has attained such a length of neck and legs that it can drink or eat from the ground only with difficulty. Even the horse is so highly specialized in limbs, teeth, and digestive organs that it could not, without human aid, survive great changes in environment. H. G. Wells once pictured the Martians as little more than nervous systems, but on neither Mars nor Earth could nervous systems develop apart from a corresponding development of nutritional and circulatory systems. In fact, life persists by preserving external and internal balance—balance between the organism and the environment, balance among the various parts and functions within the organism. There is no likelihood that the brain of man will ever greatly overbalance his other organs, and if this should happen it would lead to overspecialization and extinction.

Of course knowledge will grow from more to more, but this will be by the process which we know so well of each generation building on the work of previous generations. This does not involve continual growth of the brain and intellect of individuals, but rather increasing cooperation between individuals. The advancement of science and invention, of agriculture, industry, commerce, of education and government, of peace and war, are all the results of cooperative efforts of men in society. This is the direction in which human progress has been going for many thousands of years, and this is the course which it is sure to follow while the present species endures.

In short, the main direction of human progress has turned from the path of further differentiation of the individual to that of increasing differentiation and integration of society. Professor C. O. Whitman once wrote, "Differentiation and integration are companion principles

of progress." But in human society differentiation has outrun integration, specialization is far in advance of cooperation. Now, for the first time in the long history of man on earth, wars and revolutions are world-wide, conflicts are totalitarian, the attempt is being made to force cooperation upon all nations by violence. Forced cooperation has often failed in the past when tried on a smaller scale, whereas the democratic process of cooperation through persuasion, education, and majority rule has measurably succeeded, notably in these United States. Is a genuine federation of the whole world possible? Evidently this is the goal toward which these world-wide conflicts are aimed. Perhaps they are the birth pangs of a new order of national and international cooperation. Surely this goal will ultimately be reached if human intelligence and the race itself survive.

5. FACTORS OF PROGRESS: NATURAL SELECTION AND ORGANIC SELECTION

As is well known, Charles Darwin concluded that natural selection, or the elimination of the unfit, is the chief but not the only factor in organic evolution. He observed that organisms vary in many directions some of which are more fitted to survive than others, and these are favored in the struggle for existence, while the less fit are eliminated. Many criticisms have been brought against this theory. Jacques Loeb once said, "Darwinism is the theory which says, 'Animals that can't live, die.' " But if there are hereditary differences between animals that can live and those that can't, this does explain the survival and perpetuation of those that can, that is, the fit. Natural selection does not create the forms which it selects, but it does guide the course of evolution, and it does offer a formal explanation of the existing fitness of organisms.

In Darwin's theory, the environment is the chief factor which eliminates the unfit; overcrowding, lack of foods, adverse climatic conditions, if sufficiently severe, lead to the death of those individuals least able to endure and to adapt themselves to the new conditions. To a certain extent all organisms have the ability of adaptation or adjustment. This is one of the fundamental characteristics of living things. In this process of individual adaptation there is no elimination of unfit persons, the organism persists throughout, making many different responses to the adverse conditions, and by a process of "trial and error," and finally trial and success, adaptation to the new conditions is attained. This process is seen most clearly in cases where adjustment is made by movement. Long ago Jennings showed that if Paramecia are placed in a trough of water, one end of which is hot and the other cold, they swim at random in many directions until they get into hot or cold water, when they back, turn into a new path, and go forward until they strike some obstacle or again come into hot or cold water, when the process of backing and turning into a new path is repeated. As a result of many such trials and errors they ultimately gather in a region somewhere between the hot and cold ends of the trough. Here is a case of beneficial adjustment to environment by means of random movements with the elimination of those movements which are not beneficial or satisfactory. It resembles natural selection except that adjustment is attained by the elimination of unfit (unsatisfactory) responses instead of unfit persons.

Multitudes of adjustments to new or adverse conditions are made in this way; indeed, it seems probable that all adjustments of individuals to novel conditions, such as acclimatization, tolerance of poisons, encystment of foreign

objects or parasites, acquired immunity, etc., are results of overproduction of responses, elimination of the useless or unfit ones, and persistence in those which are useful.

But there is one fundamental difference between natural selection and organic selection by trial and error; in the former the environment, such as heat, cold, poisons, enemies, is the eliminator; in the latter the organism itself eliminates the useless or unfit responses. This is a fundamental difference for it implies that the organism is sensitive, and is capable of differentiating between the satisfactory and the unsatisfactory, and of responding positively to the former and negatively to the latter. We shall return to this subject in the second lecture, when dealing with the development of psychic qualities. It is appropriate here to call attention to the fact that differential sensitivity of organisms represents the subjective phenomena of life reduced to their simplest terms.

No adaptation is ever perfect; it is often just good enough to pass muster; sometimes it fails, with the result that the organism perishes. Indeed death is the result of failure to make adjustment to adverse conditions. These individually acquired adaptations are frequently as perfect as inherited ones, and it is often difficult to distinguish one from the other. For example, the acquired pigmentation of the skin of white races under the influence of strong light is very similar to the inherited pigmentation of dark-skinned races; both are adaptations that protect the underlying living cells from the injurious effects of short-wave radiations. Acquired immunity to certain infections is practically indistinguishable from inherited immunity in other races. The same is true of acquired acclimatization to low or high temperatures, or to increased or decreased salinity of the water as compared with natural or inherited acclimatization. The

thickened epidermis of hands and feet which is caused by friction is essentially similar to that which is inherited. The same can be said of acquired as compared with inherited adaptations of respiration and circulation in high or low altitudes; or of acquired and inherited adaptations to the digestion of particular kinds of food; or of regenerated as compared with normal limbs of crabs and salamanders. In hundreds of such cases individually acquired adaptations are fundamentally similar to normally inherited ones, and it is difficult to resist the conclusion that the two must be genetically related.

Lamarck and his followers maintained that acquired adaptations may become inherited in the course of time and thus appear in offspring in the absence of the conditions which called them forth in ancestors. But much recent experimental work indicates that acquired characters are not inherited, and this is generally held by radical Darwinians to prove that the organism itself takes no active part in its own evolution, but is passively modified and moulded by environment. In the general functions of living things the response of the organism to environmental stimuli is the distinctive or differential factor. Can it be otherwise in the responses that lead to evolutionary changes? Whether these changes occur only in genes or chromosomes or germ cells or organisms as a whole, are they not physiological responses of living matter?

In both inherited and acquired adaptations there is overproduction of multifarious reactions (mutations and responses), elimination of the unfit or unsatisfactory, and survival (persistence) of the fit or satisfactory. The result is essentially the same whether the elimination is caused by the environment or by the organism, or by both. Such words as "fit" and "satisfactory" have a purposive and subjective

significance, and therefore they and all that they stand for are taboo with strict mechanists, but few of these "iron men" deny the fact that human beings and higher animals experience satisfactions and dissatisfactions and that they seek the former and try to avoid the latter; even lower forms of life act "as if" this were true of them.

But if individual adaptations, which have been acquired through ability to differentiate between the satisfactory and the unsatisfactory, are never inherited, there would seem to be no way in which organisms can take an active part in their own transformations; they would be mere clay in the hands of the potter, environment. Certainly there is no evidence that animals and plants exercise any *conscious* purpose in their transformations. Lamarck held that "appetency" or desire is a factor in the evolution of animals and by some this hypothesis was carried to such absurd lengths that Darwin wrote to Hooker, "Heaven forfend me from Lamarck's nonsense of . . . adaptations from the slow willing of animals!" This notion was satirized by scientists, popular writers, and even by poets. Lowell wrote in his *Biglow Papers,*

> Some filosofers think that a fakkilty's granted
> The minnit it's felt to be thoroughly wanted,
>
> . . . . . .
>
> That the fears of a monkey whose holt chanced to fail
> Drawed the vertebry out to a prehensile tail.

This Lamarckian factor of evolution has been generally discredited and abandoned; it could not be applied to lower animals and plants, if appetency is given the meaning of desire or volition. But in the sense of appetite, need, drive, urge, *élan vital,* it is a factor in the *behavior* of organisms —but not in their *evolution* unless acquired adaptations can be inherited.

Although Darwin rejected Lamarck's factor of appetency, he accepted his doctrine of the inheritance of modifications (adaptations) caused by the direct action of environment or by use or disuse. In this way Darwin supposed that the organism itself took some active part in its transformations. This conception of the cooperation of any organism in its own evolution was carried much further by Darwin in his hypothesis of sexual selection, in which the female was supposed to exercise some choice in the selection of the male. It has been shown that this psychical or aesthetic form of mate selection cannot apply to lower animals or to plants, and it has generally been discredited. But in human experience there is such a thing as mating preference, and a thorough-going evolutionist should be willing to look for its beginnings in lower forms of life. There is no doubt that there are mating preferences in many higher animals, and even in lower animals it is usually as difficult to mate different races or species as it is to get foreign sperm to enter and fertilize an egg. These sexual affinities or antagonisms are generally regarded as tropisms which are chemical in nature, and this raises the philosophical question whether psychical phenomena may not be chemical in origin, or conversely whether *elements* of the psychical may not be found in chemical phenomena. This philosophical problem cannot be dealt with here.

It seems to me probable that further study of the factors of evolution will show that differential sensitivity and reactivity, which are the psychic elements basic to feelings and intelligence, have been factors in organic evolution. But at present, in the absence of evidence of the inheritance of acquired adaptations, it is not possible to prove that organisms have taken any active part in their own evolution, that is, in the transformation of one species into another. But

at least acquired adaptations do preserve the lives of individuals, giving time for inherited adaptations to appear by multifarious mutations, as is now believed. This is the "organic selection" of Baldwin and Osborn, which might better have been called "response selection" or "intrapersonal selection" in contrast to the "personal selection" of Darwin.

At present we see human intelligence at work in the improvement of animal and plant species, we see animal intelligence and instinct active in the survival of higher animals, and differential sensitivity and reactivity as factors in the survival of every living thing. Is it unreasonable to suppose that something basic to intelligence and purpose is found in all organic evolution?

6. THE ROLE OF EUGENICS

Millions of human beings are born so defective in organization that they cannot survive and leave offspring, and although we may attempt by every means in our power to preserve them, we cannot do it. Other millions not so seriously defective we do manage to preserve, with the result that modern society is burdened with multitudes of feebleminded, epileptic, insane, deaf, blind, and deformed, some of whom, at least, transmit these defects to their children. It is because of the weakening of natural selection that the human race contains so many defectives. Galton said, "Our human stock is far more weakly through congenital imperfection than any other species of animals, whether wild or domestic."

Unquestionably this greater imperfection of modern man is the result of nullifying the law of natural selection, so far as that is possible, and of failing to replace it by intelligent human selection. Throughout the course of past evolution,

the perfecting principle by means of which animals and plants have been prevented from deterioration, and have been adapted to changing environments, has been the continual elimination of the less fit and the perpetuation of the more fit, that is, the Darwinian principle of natural selection. But by means of his intelligence and inventiveness, modern man has often succeeded in preventing the elimination of the unfit, and by the most extraordinary efforts has preserved the lives of the diseased, defective, delinquent, and insane, and has permitted them to breed as freely as they can, with the result that, whenever any of these defects are hereditary, they are passed on to future generations. Thus arise families and stocks characterized by hereditary feeble-mindedness, epilepsy, dementia, deaf-mutism, some types of blindness, haemophilia, muscular atrophy, and numerous other defects of practically every organ-system of the body.

To eliminate such defective stocks by their ruthless destruction, as occurs in nature and as was practiced in ancient Sparta, would violate our social sentiments of mercy, compassion, and charity. But the preservation of the lives of the unfit does not necessarily require that they should be permitted to leave offspring and thus to perpetuate hereditary defects. It is right and proper that society should care for those of unfortunate inheritance and thus set aside the hard rule of the elimination of the unfit, but it should replace the ruthless process of natural selection by the humane method of intelligent human selection of those who are permitted to procreate their kind. This is the program of eugenics, and although we hear less about this now than we did a few years ago, there is much evidence that it is making progress, not merely in legislation providing for the segregation or sterilization of defectives, but much more in the general and serious concern of prospective parents that

their children shall be "well born." The increasing burden of caring for defectives will surely lead to increasing efforts to protect society from this burden, and to more rational customs of preventing the propagation of hereditary defects, and thus to more scientific methods of population control.

This is a program which is already in force in many enlightened societies. Persons showing the most serious hereditary defects are in many states prevented from passing these on to offspring by segregation of the sexes in public institutions, or more rarely by sterilization. But those enthusiasts who think that a new and better race can be produced in this way do not consult reality or reckon with statistics. No breeder of domestic animals or cultivated plants would ever expect to improve his stock by such feeble methods. They are necessary to prevent further deterioration but they offer no hope of improvement.

A much more potent means of race improvement, indeed the only means of improving inherited traits, is by the positive method of breeding from the best stock. So far as the human species is concerned this is a counsel of perfection, but at least a gain would be registered if the fashion could be established in society that leaders in thought and action would be expected to have large families, and that, when they do not, it would be generally recognized that they are shirking their most important social duty or that they carry some secret hereditary defect. That such a social consciousness or fashion can be established is shown in many countries of the East, where the continuance of the family is held to be the highest social and even religious obligation, but where too little attention is paid to hereditary quality.

In the present temper of the world the human species would not be improved by the wholesale sterilization of

those persons, nations, and races that conquerors and tyrants may proscribe—even if such a thing were possible. With class, national, and racial hatreds rampant, there is no possibility that a scientific program of eugenics can be wisely enforced. Instead of intelligent mate selection and ethical education aimed at producing the best physical, mental, and moral qualities, we see at present in certain countries a return to the law of the jungle, with natural selection operating on the lowest plane of physical strength, cunning, cruelty. This is "Nature red in tooth and claw," aimed at producing "the blond beast," and with slight regard for those distinctively human and civilized qualities of reason and altruism. It is a return to conditions of savagery and barbarism which prevailed in the early history of human society, survivals of which still persist. In the modern world, competition has led to the seizing of the best parts of the earth by the most aggressive and powerful types, and the expulsion of others to the less desirable places, such as Arctic areas, desert wastes, tropical jungles, and barren mountains; or, within a single society, to slums, ghettoes, and marginal lands. It has led to the enslavement or exploitation of certain races, tribes, or classes by others, in accordance with what has been called,

> Nature's simple plan
> That those should take who have the power
> And those should keep who can.

Whether mankind can ever become really civilized is a serious question. Certainly it will not be accomplished by breeding brutes, nor, on the other hand, by eugenical sterilizations. Rather it will come, if it ever comes, by way of ethical as well as eugenical education. Of course science recognizes the importance of good environment as well as of good heredity. All that heredity contributes are genes,

factors, potentialities. These potentialities become realities only in the process of development, and development is controlled not only by genes, but also by all the environmental conditions under which genes function. Environment, no less than heredity, enters into the results of development. This is especially evident in the later development of human beings, when example, instruction, habits, the desire of approval and fellowship are potent factors in shaping character. New-fangled eugenics will never replace old-fashioned education, but each should supplement the other.

7. THE FUTURE EVOLUTION OF MAN

One of the lessons of the long perspective of past life on the earth is the probability that it will have an equally long future. When it was thought that life had only recently appeared, it was logical to conclude that it would soon end. Prophets, poets, and seers predicted the speedy end of the world. John in Patmos saw in vision the angel standing with one foot on the sea and the other on the land and swearing that time should be no longer. Peter proclaimed "The day of the Lord in which the heavens shall pass away with a great noise and the elements shall melt with fervent heat."

Scientists predicted that the end of the world, or at least the end of all life on the earth, would come with the burning out of the sun and its failure to give out light and heat. They estimated that the sun was burning up at such a rate that it could continue to give out light and heat for only a few more thousand years. Bayard Taylor, taking his cue from these scientific predictions, wrote of human survival,

> Till the sun grows cold,
> And the stars are old,
> And the leaves of the Judgment Book unfold.

Thomas Campbell's poem on "The Last Man" deeply impressed me in my youth and I recited lugubriously:

Go, Sun, while Mercy holds me up
  On Nature's awful waste
To drink this last and bitter cup
  Of grief that man shall taste—
Go, tell the night that hides thy face,
Thou saw'st the last of Adam's race
  On Earth's sepulchral clod,
The darkening universe defy
To quench his Immortality,
  Or shake his trust in God!

Of the coming end of the world, Byron wrote:

I had a dream which was not all a dream.
The bright sun was extinguished, and the stars
Did wander darkling in the eternal space,
Rayless, and pathless, and the icy Earth
Swung blind and blackening in the moonless air;
Morn came and went—and came, and brought no day,
And men forgot their passions in the dread
Of this their desolation; and all hearts
Were chilled into a selfish prayer for light.

One hundred years ago, in 1841, William Miller, a religious leader of Low Hampton, N. Y., predicted the second coming of Christ in 1843 to take with him to Heaven the souls and bodies of all the righteous and to cause the earth to dissolve in fervent heat. So profound was the effect of his preaching that it produced "the temporary insanity of hundreds of thousands of his followers" and filled the hospitals for mental diseases. The first volume of the *American Journal of Insanity* spoke of Millerism as being "as bad as an epidemic of cholera or yellow fever." Millerites assembled, on the day appointed, in their ascension robes of white sheets and sometimes with their most precious possessions strapped to their backs, and waited for the sound of the trump of the Archangel announcing "the end of all things mortal." When that day came and went without the

expected event, it was said that a mistake had been made in the date and a new date was set for "the end of the world." I can remember groups of Millerites and Second Adventists some sixty years ago, who were still waiting for "the end of the world," though their ascension robes were worn rather shamefacedly. A few years ago a new prophet of the end of the world arose in Pastor Russell. He was less definite about the exact date of the catastrophe than was Miller, but it would be very soon. His followers left many signs along the roadsides in this country reading, "Many now living will never die. Prepare to meet thy God for the end is at hand."

Contrast all these expectations of the burning out of the sun and the speedy end of the world with the modern view of the incalculable stores of atomic energy in the sun and the unimaginably long time, about ten billion years (Bethe), before it shall fail to light and heat the earth so that it will continue to bring forth seed time and harvest. Contrast this short view of life and of human history with the long view which science now reveals. There is every good reason to think that the future of the earth and solar system will be as long as the past, and that the clock of life on earth will go on for at least another twelve hours, of a hundred million years each, from high noon to midnight.

What the course of organic evolution will be in these coming millennia no one can foresee. The student of evolution knows that its course has not always been forward, there have been many back currents and eddies in the stream of life; many puissant and promising types have appeared, and for a time have dominated the earth, only later to undergo regression, decay, and extinction. Giant cephalopods and fishes were the terrors of paleozoic seas; enormous reptiles dominated the land, the water, and the

air; the tread of titanosaurs and titanotheres shook the ground; gigantic birds and beasts flourished, whose modern representatives are but faint echoes of their mighty predecessors.

Every thoughtful evolutionist must have asked himself whether the human species may not, like a multitude of other species, reach a climax and then go down and become extinct. Nature plays no favorites in the struggle for existence and she will make no exception in favor of man. It is generally supposed that extinction of species in the past has been caused by adverse conditions or overspecialization. Extinction within the historic era has often been caused by man or by changes in environment. But unless a species is peculiarly localized in distribution and uniform in organization, it is not exterminated *en masse;* rather it is eliminated piecemeal, one local variety or breed after another failing to perpetuate itself, until the entire species becomes extinct. The human species is so widely distributed over the earth, and is so lacking in uniformity of organization, that it is practically certain that, barring some astronomical or geological cataclysm, it will never be destroyed *en masse.* On the contrary, it is probable that decline and decay will creep gradually over families and stocks, subraces and races, leaving more viable and virile lines untouched. This is precisely what is happening throughout the world today. Some families and subraces are declining and disappearing while others are flourishing and increasing.

In countless ways man is taking part in his own transformations not only by such destructive processes as dysgenics, voluntary sterility, racial and social conflicts, and the mass murders of modern wars, but also in the beneficial results of modern medicine and sanitation, education and eugenics, social organization and ameliorization, and the struggle for

higher ideals of ethics, aesthetics, and religion. Intelligent purpose has become an important factor in human progress but not necessarily in the production of a new species. There are many reasons for thinking that man may never by his own efforts produce a higher species than *Homo sapiens*. In the past, new species have arisen through the appearance of new mutations that were better fitted to conditions of existence than the parent stocks, which they then gradually replaced. But the fact that man is able to so large an extent to control his environment reduces the importance of this cause of evolution. Some human families and stocks are more fertile and resistant to disease than others, and they may well replace the less fertile and less viable, but, since all existing human races belong to one and the same species, this would not in itself give rise to a new species, though it would favor certain races and possibly eliminate others, and might in the course of long millennia lead to the elimination of all but a single race.

Intelligence and social cooperation make it possible for man to take a conscious part in race improvement by choosing desirable types for propagation and by eliminating the undesirable. No doubt hereditary variations or mutations occur, and will continue to occur in the human species, and the future may reveal methods by which they may be increased. The vast majority of mutations are less perfect and less viable than the normal stocks from which they come, but, assuming that beneficial mutations may occur in the human stock, what ground is there for supposing that their selection for perpetuation would lead to a new species? In so far as intelligent selection replaces natural selection in the breeding of men, ideals of perfection become factors in the production of the future race, and such ideals of men have always been and will probably always

remain specifically human and even racially limited. Members of the white race cannot now conceive of more perfect bodily forms than the Apollo Belvedere and the Venus de Milo; other races, other times may have different ideals, but they will probably always be human. The highest ideals of poets and seers are of a more perfect man, not of some other, even though higher, species. Whittier wrote of

> A dream of man and woman
> Diviner but *still human,*
> Solving the riddle old,
> Shaping the age of gold.

Scientific and humanistic prophets have often pictured a future Utopia with "men like gods," and religious prophets have pictured a future heaven like a garden or a city with god-like men, endowed with human forms and attributes but free from human imperfections and limitations. To the extent, therefore, that man can realize his highest ideals and actually become master of his destiny, it does not seem probable that he will purposively give rise to some other species. But if the species persists, and knowledge increases, progress will continue toward the goals thought most desirable.

There is abundant evidence that existing races and subraces are mingling and becoming less distinct. Geographical isolation which was an important factor in the establishment of existing races has largely disappeared under modern systems of transportation and communication. Now all races can, and to a certain extent do, interbreed, and in many parts of the world extensive hybridization is going on. There are very few, if any, really pure human races; from the standpoint of a breeder of pure stock man is hopelessly mongrelized. What the ultimate effect of this mingling of races may be is impossible to predict. Hybrids are mosaics of the characteristics of their parents; they may combine

many of the bad traits of both parents, or a majority of the good traits, and in the latter case they are better than either of the parent stocks. It is scientifically possible to produce a superior race by hybridization and the selection through many generations of the best of the offspring, but in the case of man this is at present impracticable socially.

Other changes in racial constitution are being wrought by differences in the relative fecundity and mortality of different stocks; this is one of the most important factors both in preservation and extinction of different human types. The causes of human sterility are twofold, biological and social, or involuntary and voluntary. The former are constitutional and of deep-seated nature, the latter are superficial and could be changed by changes in ideals and social customs. Biological causes of the extinction of certain families may be found in too close inbreeding of stocks carrying in their heredity certain lethal factors which destroy germ cells or embryos or individuals before they reach maturity. Such cases are found in certain royal and noble families which have had every reason to desire to perpetuate their lines, but nevertheless became extinct. Thus Fahlenbeck found that 433 noble families of Sweden had become extinct in the male line. Broman has shown that in most of the noble families of Europe the direct male line, and with it the family name, dies out in the course of from 100 to 250 years. Similar observations have been made regarding the families of great scholars, artists, statesmen, and men of distinction. It is highly probable that in most of these instances the causes of extinction are not voluntary and purposive ones.

A widespread cause of sterility and extinction is found in voluntary childlessness. With relatively rare exceptions, normal men desire to prolong their individual lives and to perpetuate their kind, and yet there are some persons who

cling tenaciously to life here, and hope for immortal life hereafter, and yet deliberately commit race suicide. This suicidal tendency is much stronger in some times and places than in others, but, wherever it prevails, it leads to a rapid extinction of the stock concerned. Throughout many populous countries of the orient there often seems to be less regard for the preservation of the individual than for the perpetuation of the family. In many occidental countries we find the exact reverse of this, namely, a deep concern for the prolongation of individual lives and a callous disregard for the continuance of the family. In the orient generally parents boast of the large number of their children, and are congratulated and envied because of this; in the occident they are often ashamed of a large family, and are commiserated or socially ostracised on this account. In the East the most honorable salutation that can be addressed to a woman is, "May you be the mother of many sons." The cry of Rachel, "Give me children or I die," is echoed in reverse by many emancipated women of the West, "I'd rather die than have children." There are many ways of committing suicide, but the most effective method of mass suicide is not by spreading wars, pestilences, or famines, but by promoting voluntary sterility.

In one of his facetious but really deeply serious addresses, Harlow Shapley canvassed the various possible ways by which the present stupid, wicked, irrational human species might be exterminated and a new start made from some other source. He showed that astronomy and geology offered little hope of an all-exterminating world catastrophe; that biology had little to offer now, since animal and plant predators and parasites and the most destructive human pestilences have been so largely brought under control; but that man himself controlled the only feasible means of his own complete extermination.

But there is no probability that this will happen while other species of higher animals are left on earth; no probability that from any other species or order or class of animals a new cycle of evolution will lead to another type of animal more perfect in body, mind, and social organization than the human species. If such a more perfect creature is ever to develop it must probably be from *Homo sapiens.* Clarence Day in his humorous book, *This Simian World,* speculated on what evolution might have led to if cats or birds or other classes of animals had been the ancestral stock, rather than monkeys. But there is no other existing species of higher animal capable of taking the dominant place which man has occupied, no other capable of giving rise to the intellectual and spiritual development which man has attained. Even the anthropoid apes would offer no prospect of success. At the close of the World War of 1914–18, the German humorous paper, *Simplizissimus* printed a cartoon showing a forlorn old chimpanzee in a shell-torn tree on a battlefield covered with the corpses of the human race, and saying sadly, "Now it must all be done over again." But evolution cannot be done over again from existing species of higher animals. If progress in the direction of greater reason and ethics is to go on, it must be from human stock, and if more perfect species than *Homo sapiens* should evolve in the countless ages of the future, it will probably not be as a result of conscious human purpose, but rather, as in the past, in connection with great secular changes over which man has no control, such as the rising and sinking of continents, the formation of deserts or mountains or oceans, or changes in climate comparable to the glacial and interglacial epochs, during which human evolution made such wonderful progress. Man is the last, best hope of future evolutionary progress in body, mind, and society.